

Office of High Energy Physics

HEPAP

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Washington, DC

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for High Energy Physics

Overview

Planning

- **Utilizing Guidance from HEPAP (P5 and PASAG Reports)**
- **Responding to changing circumstances**
 - **Delay in LHC startup and revised plans for running schedule and upgrades**
- **Preparing to respond to guidance from other sources**
 - **Decadal Survey (Astro2010)**
 - **Reviews of ongoing and proposed programs**
 - **Accelerator R&D Workshop Report**

Budgets

- **FY 2011 Budget Request has been submitted to Congress**
 - **No Congressional action (markups) yet**
 - **Expectation that there will be a continuing resolution**
- **FY 2012 Budget Request being developed within DOE**
 - **To be submitted to OBM in August**
 - **OMB Passback at the end of November**
 - **Locked down late December (or early December)**

Program Management

- **Committee of Visitors evaluation of HEP operations (October)**
- **Laboratory reviews (Electron accelerator based physics and Non Accelerator Physics)**
- **HEP Staff**



Planning

Strategic Plan

Positioning the U.S.



Program Elements

Goals *(discoveries/answers to questions)*

10-year Plan

Energy Frontier Physics

**New particles (Higgs, SUSY)
 Extra dimensions**

**Complete the Tevatron Program.
 Partner with CERN to make
 discoveries and realize the
 benefits of investments at the LHC**

Intensity Frontier Physics

**Neutrino properties
 Matter- antimatter asymmetry
 Unification of Forces**

**Implement and carry out a U.S.
 world-leading Intensity Frontier
 program based at Fermilab and
 in partnership with NSF**

Cosmic Frontier Physics

**Dark Energy
 Dark Matter**

**Implement compelling particle
 astrophysics opportunities for
 discovery in partnership with other
 agencies as appropriate**

Advanced Technology R&D

**Position the U.S. to be at the
 forefront of accelerator and
 Instrumentation technology**

**Maintain and nurture core
 competencies, encourage technology
 transfer, and mount campaigns to
 make technological breakthroughs
 that enable HEP and DOE/SC programs**

Refinement of Strategic Plan

Cosmic Frontier (HEPAP (PASAG) Report)

Optimized program over the next 10 years in 4 funding scenarios:

- **Similar to P5 funding Scenarios**

Prioritization Criteria for Particle Astrophysics

- **Science addressed by the project necessary (significant step towards HEP goals)**
- **Particle physicist participation necessary (significant value added/feasibility)**
- **Scale matters (particularly at boundary between particle physics and astrophysics)**

Priorities are generally aligned with recommendations for Cosmic Frontier in the 2008 HEPAP (P5) Report

- **Dark matter & dark energy both remain high priorities**

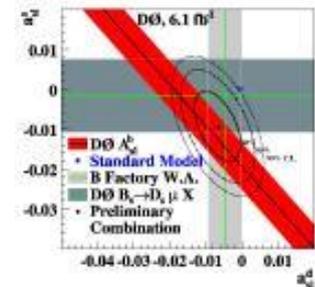
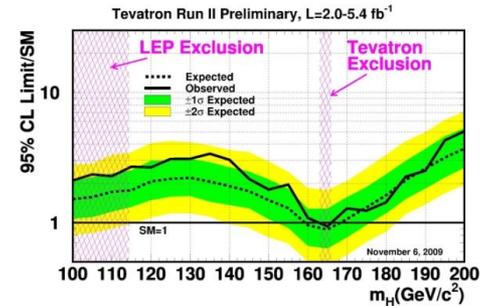
Guidance:

- **Dark energy funding (recommended for largest budget portion) should not significantly compromise US leadership in dark matter, where a discovery could be imminent**
- **Dark energy and dark matter together should not completely zero out other important activities**
- **HEP (along with NASA and NSF) awaits Astro2010 Report before decisions on proposed major projects (AGIS, Auger-North, BigBOSS, JDEM, LSST).**

Energy Frontier: Changing Circumstances

Tevatron

- Operate Tevatron in FY 2011
- Higgs: expand exclusion region or first hints
- Recent reports suggest additional "discoveries"



LHC Program

- Now colliding and recording data at 7 TeV! Great News!!
- CERN is in the process of defining its mid-term plan for the LHC program
 - U.S. is planning to participate in the LHC program
 - Participation includes detector / accelerator upgrades
 - Present US-CERN MOU lasts until 2017
 - CERN activities and plans for LHC are driving discussions of global projects

Next generation Lepton Collider

- Decision awaits results from LHC & commitments of interested participants
 - Envisioned to happen \sim FY 2012 – now expected to happen somewhat later
 - Working with ART to define a US ILC R&D FY2012–2015 program (review next week)

Working to establish a five-year national muon accelerator R&D plan

- Fermilab has been charged to organize this national effort

Investments in Plasma Wakefield Acceleration Demonstration Projects

- Recovery Act funding used to proceed on BELLA and FACET projects

Intensity Frontier: Scientific opportunities of DUSEL

- **NSF/DOE have established a DUSEL Physics Joint Oversight Group (JOG)**
 - **To coordinate & oversee DUSEL experimental physics program**
- **Agencies collaborating in defining the DUSEL physics program.**
 - **Agreed on DUSEL stewardship roles & core research program:**

Program Element	Steward	Other
DUSEL facility	NSF	
Dark matter	NSF	DOE OHEP
Neutrino-less double-beta decay	DOE ONP	NSF, DOE OHEP?
Long baseline neutrinos	DOE OHEP	NSF
Proton decay	DOE OHEP	NSF
Other disciplines (Bio, Geo, Eng)	NSF	

- **An Interagency Memorandum of Understanding (MOU) will define in more detail the roles and responsibilities**
 - **Expected to be signed before the end of 2010**

Non-Accelerator Physics: Prepared to Respond to Guidance

Looking for guidance from Astro2010 - the findings and recommendations:

- Will influence the opportunities for HEP participation
- Will inform OHEP on scientific/technical aspects of particle astrophysics (e.g.; optimum dark energy strategy with available resources)

DOE and NASA continue to work to identify the path forward on a Joint Dark Energy Mission

- Several mission concepts have been developed
 - IDECS and OMEGA presented to Astro2010 in June 2009
 - New \$650M-capped mission concept developed with Interim Science Working Group
- European Space Agency (ESA) has interest in a partnership on their proposed DE mission
- DOE and NASA have had discussions on how we might respond to Astro2010 guidance

DOE and NSF have worked to coordinated planned activities

- DOE/NSF requested HEPAP [PASAG] Report
- Discussions with NSF Astronomy on how we might respond to Astro2010 Guidance
- Discussion with NSF Physics on a strategy for Dark Matter experiments

OECD Global Science Forum Astroparticle Physics Working Group

- Global coordination and planning of astroparticle physics experiments
- Study report will be completed in Oct. 2010



Intensity Frontier:

Responding to possible Scientific Opportunities

Scientific Opportunities

- **OHEP has received a report from SLAC on possible US options in SuperB (Italy)**
 - i. **Provision of reusable PEP-II and BABAR components**
 - ii. **i + additional funding for US participation in detector program**
 - iii. **ii + additional funding for US participation in accelerator program**

- **OHEP expects to get a proposal for participation in Belle-II at SuperKEKB (Japan)**
 - **Participation in detector subsystems**

- **OHEP expects to get a proposal for implementing g-2 experiment at Fermilab**
 - **Utilizes existing Fermilab infrastructure and planned upgrades**
 - **Utilizes BNL D&D**

OHEP will conduct peer-reviews of these scientific opportunities

Accelerators for America's Future Symposium

The HEP sponsored Symposium and Workshop in 2009:

- Opportunities for connections between fundamental accelerator R&D and applications
- Guidance on the needs of federal programs and the private sector

The Workshop Report will be use in developing plans for Accelerator Science/R&D programs.

- Thanks to Workshop co-chairs (Walter Henning and Charles Shank) and participants
- Thanks to the chief editors – Judy Jackson and Walter Henning.

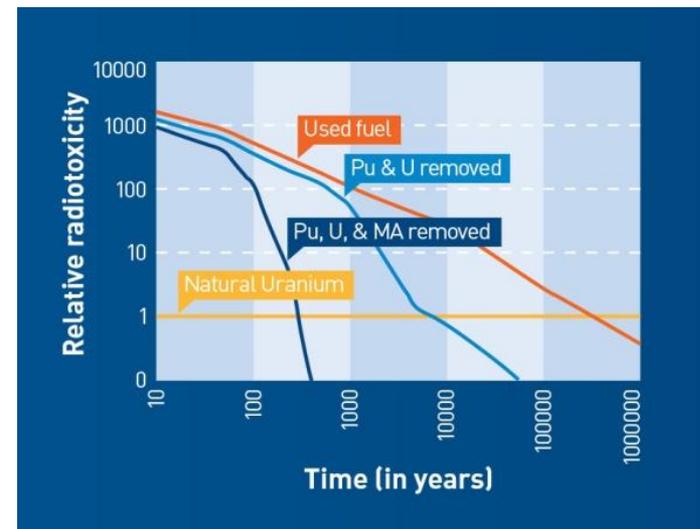
HEP is considering new initiatives (workshops, R&D centers) based on identified accelerator opportunities , research priorities, and policy issues.

A few opportunities:

- Accelerator Driven Systems
- Treatment of flue gases, waste, and water
- Isotope generation and heavy ion therapy
- Environmentally friendly industrial use
- Defense, cargo interrogation, and monitoring
- Next generation discovery science machines

Some policy issues

- Demonstration facilities
- Improved interagency, agency- industry communication
- Strengthened educational programs



Accelerator R&D Workshop

Research Opportunities

Areas of R&D identified by each working group. All areas are of importance to each working group. Color coding indicates areas with greatest impact.

R&D Need	Energy & Environment	Medicine	Industry	Security & Defense	Discovery Science
Reliability	Red	Red	Red	Blue	Red
Beam Power/RF	Red	White	Orange	Red	Red
Beam Transport and Control	Yellow	Red	Light Blue	Orange	Yellow
Efficiency	Orange	Light Blue	Orange	Blue	Yellow
Gradient (SRF and other)	Light Blue	Blue	Yellow	Red	Blue
Reduced Production Costs	Blue	Orange	Red	White	Blue
Simulation	Yellow	Blue	Light Blue	Orange	Light Blue
Lasers	Blue	White	White	Orange	Orange
Size	White	Orange	Blue	White	Orange
Superconducting Magnets	White	Yellow	Yellow	Yellow	White
Targetry	Orange	Yellow	White	Light Blue	White
Particle Sources	Light Blue	Light Blue	Blue	Light Blue	Light Blue



Color code: Increased priority



Budgets

HEP Budget Overview

HEP FY 2011 Budget Request

FY 2011 Request is a +2.3% increase compared to FY 2010 Appropriation

FY 2010 Appropriations were a +1.9% increase over FY 2009 Appropriations

(dollars in thousands)

	FY 2009 Current Appropriation	FY 2009 ** Current Recovery Act Appropriations	FY 2010 Current Appropriations	Delta	FY 2011 Request	Percent
High Energy Physics						
Proton Accelerator Based Physics	401,368	107,990	434,167	5,095	439,262	1.2%
Electron Accelerator Based Physics	32,030	1,400	27,427	-2,720	24,707	-9.9%
Non Accelerator Based Physics	101,138	4,445	99,625	-11,086	88,539	-11.1%
Theoretical Physics	66,148	5,975	66,962	2,562	69,524	3.8%
Advanced Technology R&D	195,042 *	116,690 *	182,302	7,666	189,968	4.2%
Subtotal, High Energy Physics	795,726	236,500	810,483	1,517	812,000	0.2%
Construction	0	0	0	17,000	17,000	
Total, High Energy Physics	795,726 *	236,500 *	810,483	18,517	829,000	2.3%

**** The Recovery Act Current Appropriation column reflects the allocation of funding as of September 30, 2009.**

- Total includes SBIR/STTR: \$17,730,000 of which was transferred to the Small Business Innovation Research (SBIR) program and \$2,128,000 of which was transferred to the Small Business Technology Transfer (STTR) program.**

FY 2011 Program Highlights

Energy Frontier

- **Tevatron operates in FY 2011**
- **U.S. LHC program supported**

Intensity Frontier

- **On-going MIE projects (NOvA and Daya Bay) supported on planned schedules**
- **Investments (MicroBooNE, Mu2e and LBNE) made for U.S. Intensity Frontier program**

Cosmic Frontier

- **Support ongoing programs (e.g.; Fermi, AMS, VERITAS, Pierre Auger, BOSS, CDMS-II, etc.)**
- **On-going MIE projects (DES, SuperCDMS-Soudan) supported on planned schedules**
- **R&D for possible future experiments (guidance from HEPAP (PASAG) and ASTRO2010)**

Core Research

- **EPP Research support will maintain scientific workforce and the ability to be productive**
- **Advanced Technology R&D supports high risk, high impact initiatives, development of infrastructure (e.g.; BELLA and FACET) and core competencies important for the U.S.**

FY 2011 Budget Request Breakout of Funding

Facility Operations are constant
Core Research and Projects maintained (grow somewhat)

HEP Functional Categories	<u>FY 2009</u>	FY 2009 ARRA	<u>FY 2010</u>	Delta	<u>FY 2011 Request</u>	vs FY10
Fermilab Accelerator Complex Operations	162.8	15.0	156.5	-1.4	155.1	-0.9%
LHC Detector Support/Operations	69.4	0.0	71.2	3.6	74.8	5.1%
SLAC Accelerator Complex Operations	15.3	0.0	12.1	-2.3	9.8	-19.0%
Facility Operations	247.5	15.0	239.7	-0.1	239.6	0.0%
EPP Research	284.5	24.8	286.3	10.9	297.1	3.8%
Advanced Technology R&D	167.2	78.9	162.6	4.1	166.7	2.5%
Core Research	451.7	103.7	448.9	15.0	463.9	3.3%
Intensity Frontier Projects	47.7	55.0	72.8	5.4	78.3	
Energy Frontier Projects	2.5	0.0	9.0	0.3	9.3	
Cosmic Frontier Projects	10.9	0.0	10.1	-6.1	4.0	
Technology Projects	8.0	33.7	0.0	3.2	3.2	
Projects	69.1	88.7	92.0	2.8	94.7	3.0%
Other (GPP/GPE/SBIR/STTR)	27.5	29.1	29.9	0.9	30.8	2.9%
High Energy Physics	795.7	236.5	810.5	18.5	829.0	2.3%

FY 2011 Budget Request Projects

HEP Projects (MIEs and Construction)	FY 2009			Delta	FY 2011	vs FY10
	FY 2009	ARRA	FY 2010		Request	
Project - NOvA - MIE	27.8	55.0	59.0	-12.8	46.2	
Project - Minerva - MIE	4.9	0.0	0.8	-0.8	0.0	
Project - MicroBooNE - MIE	0.0	0.0	2.0	6.0	8.0	←
Project - Mu2e - Construction (Ops & TEC)	0.0	0.0	0.0	10.0	10.0	←
Project - T2K - MIE	1.0	0.0	0.0	0.0	0.0	
Daya Bay - MIE	14.0	0.0	11.0	-8.9	2.1	
Project - LBNE - Construction (Ops & TEC)	0.0	0.0	0.0	12.0	12.0	←
Intensity Frontier Projects	47.7	55.0	72.8 ↑	5.4	78.3	7.5%
LHC Accelerator Upgrade - APUL - MIE	2.5	0.0	9.0	0.3	9.3	
Energy Frontier Projects	2.5	0.0	9.0 ↑	0.3	9.3	2.8%
Project - DES - MIE	9.9	0.0	8.6	-4.6	4.0	
Project - Super CDMS - MIE	1.0	0.0	1.5	-1.5	0.0	
Cosmic Frontier Projects	10.9	0.0	10.1 ↑	-6.1	4.0	-60.4%
FACET	0.0	14.5	0.0	0.0	0.0	
Project - SRF Electron Beam Welder - MIE	0.0	0.0	0.0	3.2	3.2	
Project - BELLA - MIE	8.0	19.2	0.0	0.0	0.0	
Technology Projects	8.0	33.7	0.0 ↑	3.2	3.2	
Total, HEP Projects	69.1	88.7	92.0 ↑	2.8	94.7	3.0%



Program Management

Program Activities

HEPAP/Advisory

- **HEPAP Committee of Visitors (COV) to examine/evaluate operations of the DOE SC OHEP**

HEP Laboratory Reviews

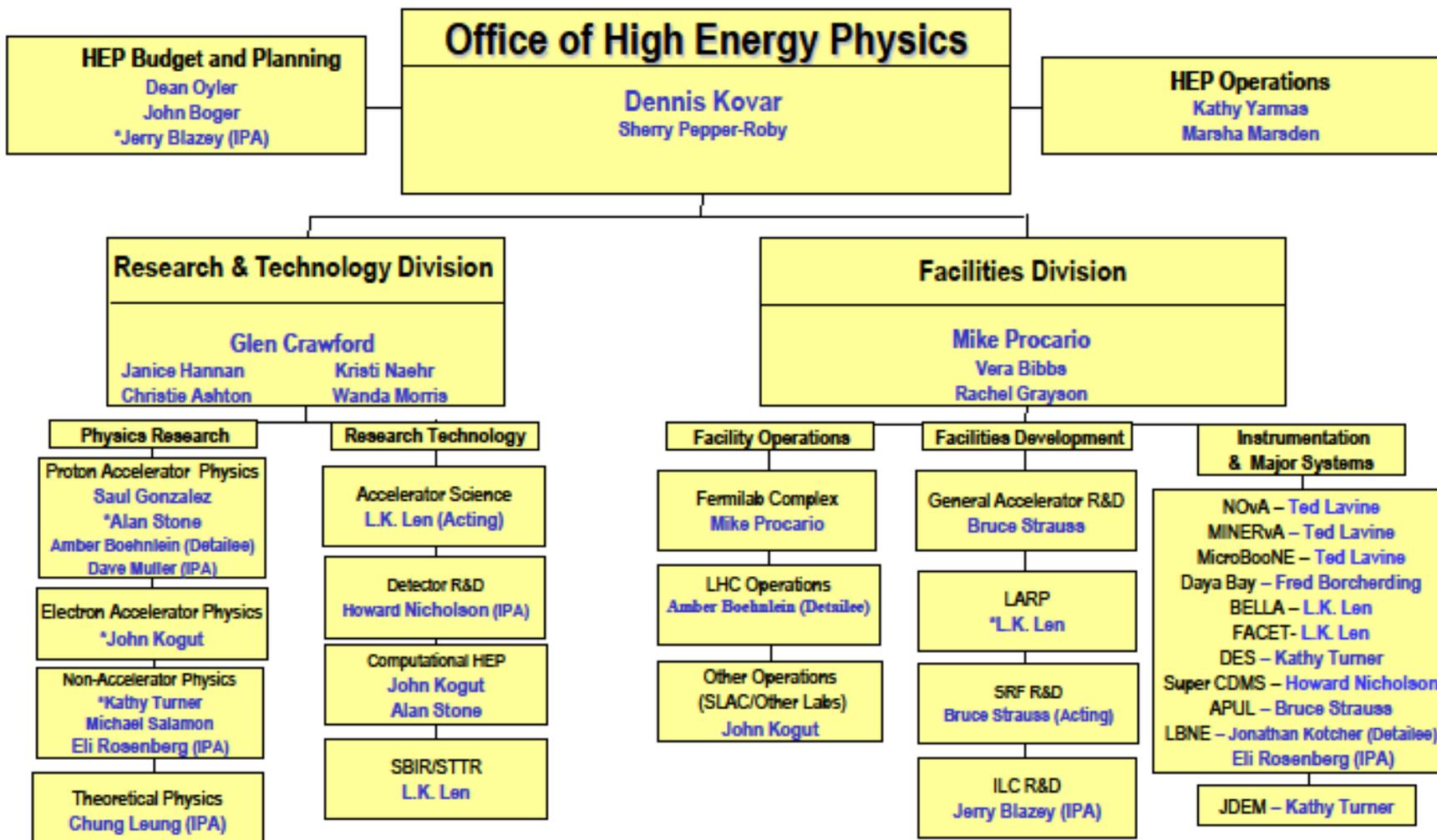
- **Electron Accelerator-Based Physics and Non Accelerator Physics**
- **Fermilab and BNL HEP peer-reviews: ANL, LBNL and SLAC HEP Office reviews**

Office of HEP Staff

- **Two recent appointments**
 - **Fred Borcharding – Program Manager for Instrumentation**
 - **Michael Salamon – Program Manager for Non-Accelerator Physics**
- **Federal Vacancies**
 - **Computational HEP Program Manager**
 - **Theoretical Physics Program Manager**
 - **Accelerator Science Program Manager**
- **Need for IPAs & Detailees (a number of appointments ending in FY2010 and FY2011)**

Collection of Information on Demographics

HEP Organization Chart



*Denotes base position

Demographics

- **HEP gathers demographics information from two sources:**
 - **ANL, BNL, Fermi, LBL, and SLAC spreadsheets submitted during annual budget briefings**
 - **From surveys of university PIs and Tother labs (JNAL, PPPL, LLNL, and LANL)**

- **Information collected includes**
 - **actual number of FTEs for FY 2009 by job classification and research activity**
 - **FTEs for FY 2010 (as planned)**
 - **projections for FY 2011 and FY 2012 based on a constant level of effort**

- **Information gathered provides a snapshot of HEP's workforce**

Demographics FY09

Total HEP workforce in FTEs

Job Class.	Lab FTEs	Univ. FTEs	Total
Fac/Rsrch Sci/Perm.	512.5	671.8	1184.3
Post-doc/Temp Ph.D	176.3	335.7	512.0
Eng/Comp Prof.	773.4	48.3	821.7
Tech Admin	1016.7	72.0	1088.7
Graduate Student	54.2	560.8	615.0
Undergraduate/other	8.8	82.2	91.0
Total	2541.9	1770.8	4312.7

University Grants

Institutions	PIs	Grants	FTEs
118	166	175	1770.8*

***Includes 19.5 FTEs from TJ, PPPL, NIST, NRL, LANL, LLNL**

Total FTEs: 4312.7

Demographics FY09

Scientific workforce* by research area

Research Area	Lab	University	Total
Protons	233.6	730.9	964.5
Electrons	38.0	80.1	118.1
Non-accelerator	107.7	190.3	298.0
Theory	92.9	417.8	510.7
Accelerator Sci	46.5	124.1	188.3
SciDAC	2.7	12.3	15.0
Detector R&D	11.7	13.1	24.8
total	533.1	1568.6	2101.7

***Includes, grad students, post docs, faculty, and research scientists.**

In FY09, 48% of entire HEP workforce is scientific personnel (2102/4313).